How Community Solar and Solar+ Adds Up for Texas Electric Cooperatives

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for the
Texas Electric Cooperatives and
Texas Solar Energy Society
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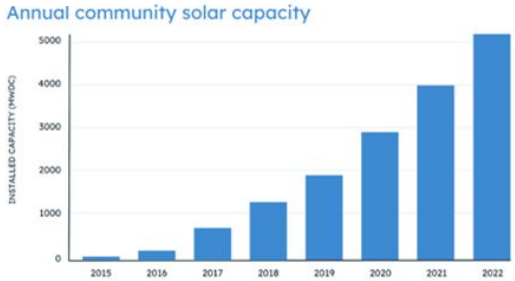
Cliburn and Associates, LLC

National Goals for Community Solar

Represents an increase from **3 GW to 20 GW** of community solar capacity

$1 billion in savings reflects an average **bill reduction of 20%**

Source: [National Community Solar Partnership]



Source: [Coalition for Community Solar Access]

Solar Value Project

Community-Scale Solar, Storage and Load Flexibility

SolarValueProject.com - A repository for on local solar and solar+ for co-ops and public power

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- Process
- Design
- Procurement
- Marketing
- Companion Measures
- Assessment

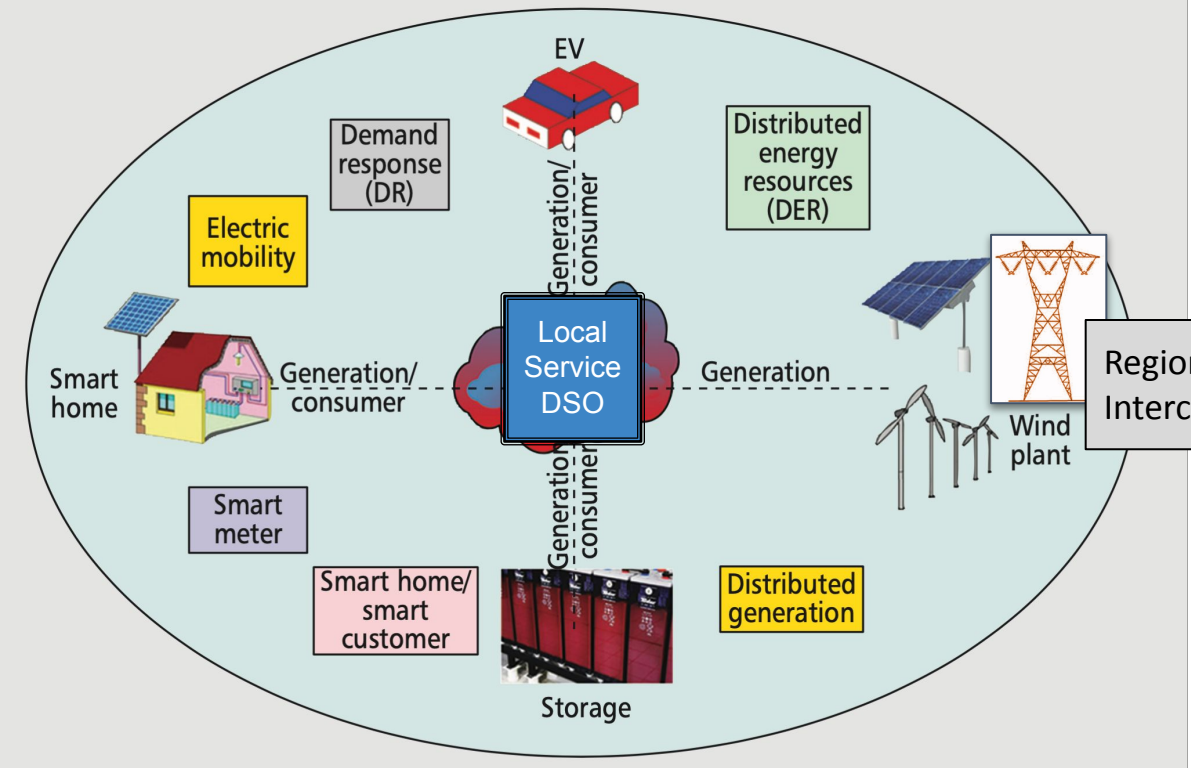
- Fundamentals
- Procurement Guidance
- Decision Model
- Market Growth

The Sol energy thinkers -scale solar bet and load flex -value innovati ng access t ces and expert consultir

This web by our work on a multi-year U.S. DOE-funded effort called the Community Solar Value Project. Most CSVP resources remain timely and are provided under the tab for Shared Solar Solutions. Today, we continue to expand our efforts, supporting new projects through the National Community Solar Partnership as well as leading the Solar-Plus for Electric Co-ops project and other work at Cliburn and Associates in solar-plus, resource integration, change management, and policy. Follow our Blog or reach out for more information.

Resource variability is just one issue that solar-plus strategies can address.

Local Energy Matters



Source: On Hernandez, L. (CIEMAT)

Local Solar and Solar+

- Member engagement / choice
- Integration of energy and information
- Beneficial electrification
- Staged modernization
- Demand-related savings
- Ancillary services (as available)
- Reliability
- Resilience
- Hometown jobs
- Energy equity
- Reducing low-income energy burdens

Texas is Solar Country

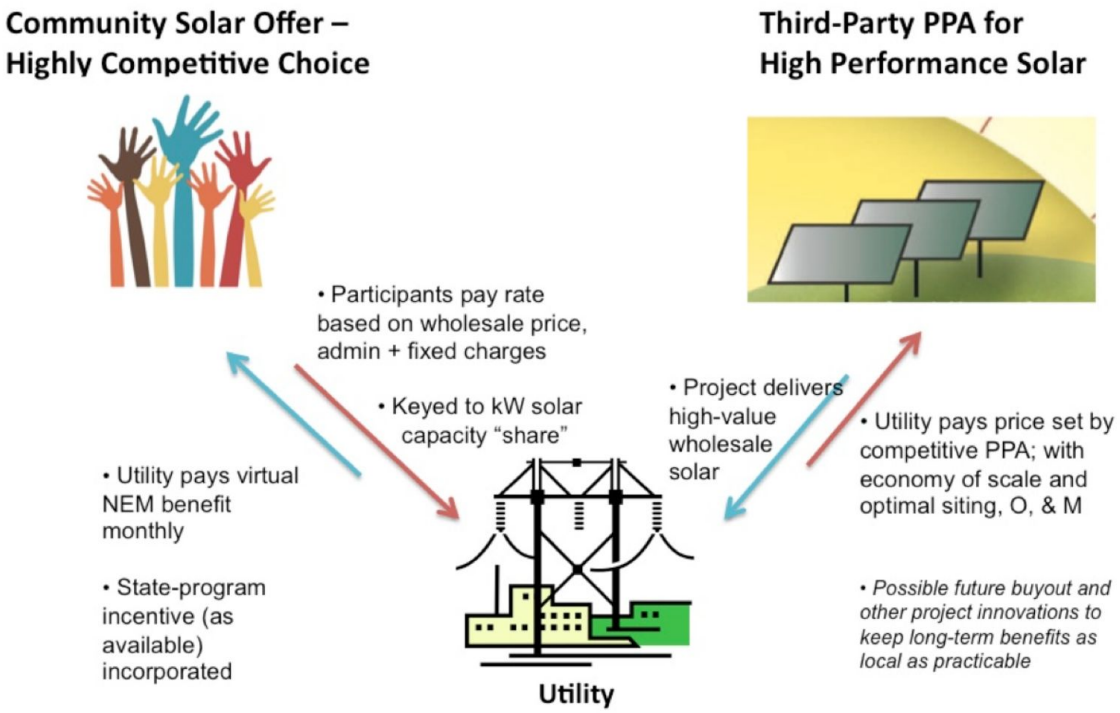
- Texas was the top-ranked state for solar growth in 2021, adding 6 GW. California, ranked #2 in 2021, added just 3.6 MW, according to Wood Mackenzie/ISEA, March 2022.
- Yet additional distribution-level solar is vastly under-counted. An estimated 15% more solar growth occurred in Texas in 2021, from local solar projects, according to Dr. Joshua Rhodes in a study for Conservative Texans for Energy Innovation.
- Local solar is a potential contribution to national targets for 2035: 630 GW of wind and 450 GW of solar by 2035… 85 GW of new renewables/year.

Texas Community Solar to 2019

Utility	Utility Type	Project Name	Project Developer	Location	Size (MW-AC)	Year	Subscrip-tion Model
Austin Energy	Muni	Austin Energy Community Solar Program (Palmer Array)	PowerFin Texas Solar Projects	Austin	0.19	2017	PAYG
		Austin Energy Community Solar Program (La Loma)			2.6	2018	
Bandera Electric Cooperative	Co-op	BEC Community Solar	SoCore Energy	Leakey	1.9	2018	PAYG
Co-serv Electric	Co-op	CoServ Solar Station	Co-serv for-profit entity	Krugerville	2.0	2015	PAYG
CPS Energy	Muni	RooflessSolar	Clean Energy Collective	Adkins	1.2	2016	PUF
		Big Sun Community Solar	Go Smart Solar	San Antonio	5.0	2019	PUF
El Paso Electric	IOU	El Paso Electric Community Solar	M+W Energy	El Paso	3.0	2017	LL
Green Mountain Energy	REP	Go Local Solar Texas (Dakota Solar Park)	Green Mountain Energy	Meridan	5.0	2019	PAYG
		Go Local Solar Texas (Gable Solar Park)	Green Mountain Energy	Wallis	10	2019	
Guadalupe Valley Electric Cooperative (GVEC)	Co-op	SunHub	SoCore Energy	Gonzales	2.0	2017	PAYG
Mid-South Synergy	Co-op	Synergy Solar	Mid South Synergy Water Resources	Bedias	1.98	2016	PAYG
MP2 Energy	REP	Farm to Market	LocalSun Energy	Sealy	1.5	2016	PAYG
Nueces Electric Cooperative (NEC)	Co-op	RooflessSolar	Clean Energy Collective (CEC)	Orange Grove	0.7	2016	PUF
Pedernales Electric Cooperative (PEC)	Co-op	Cooperative Solar Program	Renewable Energy Systems (RES)	Austin	12.98	2018	PAYG
Southwest Rural Electric Association (SWRE)	Co-op	Frederick Solar Field	Western Farmers Electric Cooperative	Frederick, OK	0.25	2017	PUF
		SWRE Community Solar Vernon		Vernon	0.1		
TriEagle Energy	REP	SunEagle	Cypress Creek Renewables	Walnut Springs	5.0	2016	PAYG
United Electric Cooperative Services	Co-op	United Community Solar Plant	Turning Point Energy / DEPCOM Power	Clifton	9.9	2019	PAYG

Source: NREL

Community Solar 101



Credit: SMUD/Solar Value Project

Game-Changer? New Federal Funding

1) The $1.2 trillion bipartisan infrastructure law passed in late 2021. Electric co-ops may qualify for more than $100 billion of that funding, for broadband expansions, electric vehicle charging networks, clean energy and grid resiliency work.

2) Inflation Reduction Act (IRA) energy provisions, with implementation guidelines available this month, offer benefits for electric co-ops, including

   a) Solar and storage ITC of 30% or more, available by direct payment; also PTC direct-pay options for qualified technologies
   b) $9.7 billion allocated through USDA for loans and grants, plus $1 billion for a (50%) forgivable solar and storage loan program;
   c) Opportunities to participate in technical assistance and prize programs;
   d) Customer-side tax credits, and $9 billion for customer-side efficiency and electrification programs.

Kerrville, TX, Public Utilities
Community Solar for Non-Profits and LMI

Photo by M. Argin, used by permission of Mike Whittler, KPUB.

CASE STUDIES EXEMPLIFYING ACTIVATION PATHWAYS

Funding organizations

CBO: The Kerrville Public Utility Board (KPUB) is a municipally owned electric utility that serves around 22,750 customers in a 146 square mile service area in Kerr County, Texas

Project: Multiple projects under .99MW – total capacity of 5.25 MW.

Activation Pathways: KPUB had been waiting for prices to become more competitive with their standard rates so that getting involved in the solar market makes financial sense. After finding an opportunity to size the solar arrays to avoid wholesale market transmission charges, KPUB received a U.S. Department of Energy Solar in Your Community grant. The grant allowed them to move forward with community solar for LMI customers, which aligns with their mission to provide safe, reliable, and cost effective services to their customers. As a utility, KPUB had the pre-existing resources, such as utility expertise and relationships with local nonprofits, to integrate CSS projects. KPUB worked with a bridging developer and arranged a power purchase agreement through which they purchase all of the energy to sell to customers. The arrays were installed on property owned by non-profits who receive 50% of the energy in exchange for the land agreement. Subscribers were acquired by working with a property manager that leases exclusively to LMI customers, which eliminated the need for KPUB to complete income checks.

Future Plans: KPUB can serve another 300-400 LMI customers with the systems they have built, and the focus is now on filling remaining subscriptions. They are also hoping to develop educational opportunities around the solar arrays.

Source: Texas Community Solar Roadmap 2020

Four More Examples

Roanoke, NC
Solar-Plus Efficiency
Storage & Clean EVs

OPALCO, WA
T&D Deferral &
Resilience

Ames, IA
Community Solar

Grand Rapids, MN
Solar-Plus

Mid-Point Question

Graphic from Beck, Chan and Rai 2020

Testing a New Solar Plus Efficiency-Savings Model

- Orcas Power and Light Co-op (OPALCO) community solar, near Seattle
- Past approach funded a subsidy pool for non-profits and LI emergency assistance.
- For this project, the co-op wanted to provide direct benefits to LI customers, but solar alone would not show net savings for many years.
- What if solar generation funded incentives and on-bill financing for beneficial electrification?

Above: OPALCO Decatur Solar + Storage Project

Our TA helped OPALCO to design and model a program that would engage LMI customers *and save them more* by using a solar-plus-efficiency approach.

Replication of the OPALCO analysis requires region-specific calculations For solar PV and heat pump water heater equipment

- Relative to local rates, incentives, climate
- Mindful of installation options
- Added utility value for demand-response and electrification (not calculated, but significant)

OPALCO has one of the worst solar resources and the lowest electricity rates in the US. ***Yet we found that after 2 Years, LMI customers could save ~$18.60 or more per month ($223/yr), and that savings would persist for for 8 to 18 years.*** *More LI participant options (weatherization, DR devices, high-efficiency controlled AC) also may be tested.*

Note, in modeling for New Mexico, we found that the better solar resource would more than compensate for a state subsidy that OPALCO received.

North Carolina EMCs Solar+

NC EMCs is a national leader in developing solar+ from the top down and the bottom up, including a total of nearly 20 solar-plus-storage or microgrid projects, supporting grid management, resilience, DER integration, multiple generation systems, and more. State and regional policies encourage regional (NC EMCs) leadership, but at least one local co-op has innovated community solar+.

Initial Microgrid Sites

Roanoke (NC) Solar + Storage + LMI Benefits

- **Roanoke Electric Cooperative** has been a leader in community solar and solar plus battery storage (BESS) deployment. Its *Solar Share, Local Land Partnerships,* and *Upgrade to Save* programs optimize local benefits. The co-op has used project benefits and philanthropic contributions to fund shares and cost-saving repairs and electrification upgrades to LMI members.
- **NC EMCs, the wholesale G&T supplier,** limits the amount of solar owned by local co-ops and prefers to own the storage. This optimizes systemwide dispatch and eases the burdens for some co-ops. Yet Roanoke wants to strike a balance and benefit its local economy.

- **This TA effort used "SPECs" solar-plus-storage economic modeling** to help the co-op understand project value under a variety of conditions and to negotiate a beneficial agreement with the G&T, to continue achieving community solar goals. Further work is being supported by NCCETC.

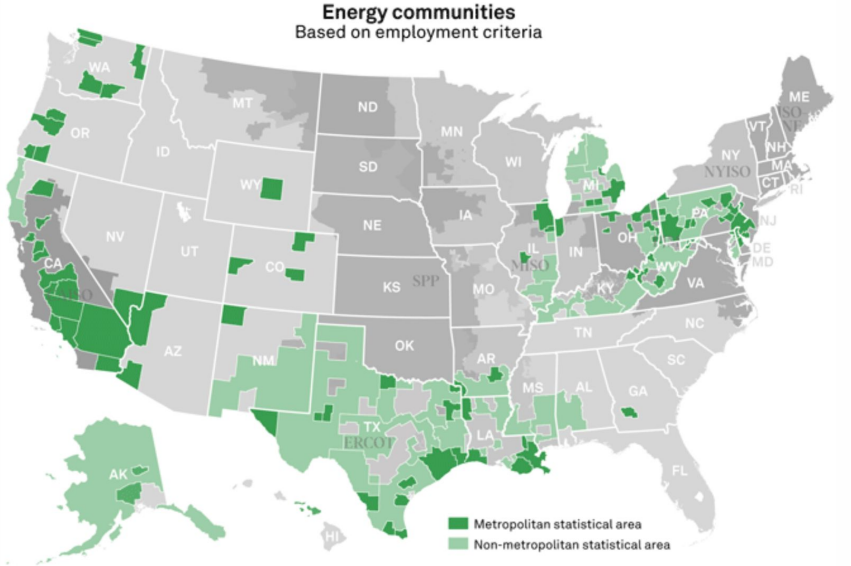
PV + BESS Analysis (Purchase) w/ ITC Adder

- Ten scenarios were tested. Driving benefits included demand reduction from SAT solar and storage; beneficial siting for distribution upgrade deferral; careful selection of battery capacity and duration; and financing benefits.
- Tested under the new IRA: PPA is still a strong alternative, but ownership allows more operational flexibility.
- There a many possible opportunities for increasing the ITC from 30%. With a single 10% adder creating a 40% ITC would double the project ROI to 42%.
- It's worth considering partnering with customer-side projects, to increase co-op demand reduction, electrification and resilience benefits.

ITC	30%	30%	40%
Battery energy unit cost ($/kWh AC)	$550	$550	$550
Financing Loan Time (yrs)	5	10	5
PV System Capital Cost (NPV)	$775,237	$794,003	$664,489
Battery System Capital Cost (NPV)	$1,161,290	$1,189,402	$995,392
Demand Reduction (kW/yr)	7,769	7,769	7,769
Battery discharge hours/yr	129,382	129,382	129,382
Avoided Local Demand Cost	$1,841,470	$1,841,470	$1,841,470
Avoided Wholesale Energy Cost	$479,947	$479,947	$479,947
ROI	21%	18%	42%
NPV	$413,188	$366,310	$689,835
B/C	1.21	1.18	1.42

What is an Energy Community?

1) Census tracts and all adjacent ones in which any coal mine or coal plant has retired after 12/31/99; 2) …Where, after 12/31/99, industries tied to fossil fuels have accounted for at least 0.17% of direct employment or 25% of local tax revenues, and where the unemployment rate is above the national average for the previous year. 3) Brownfield sites at least 450,000 across the country. See also: US Treasury announcements.



As of Sep. 20, 2022.
U.S. metropolitan and non-metropolitan statistical areas with estimated fossil fuel employment at or above 0.17% of the total and unemployment rate at or above the national rate from June 2021 through June 2022.
Excludes New England townships.
Map credit: Ciaralou Agpalo Palicpic.
Sources: S&P Global Market Intelligence; U.S. Bureau of Labor Statistics; U.S. Census Bureau.
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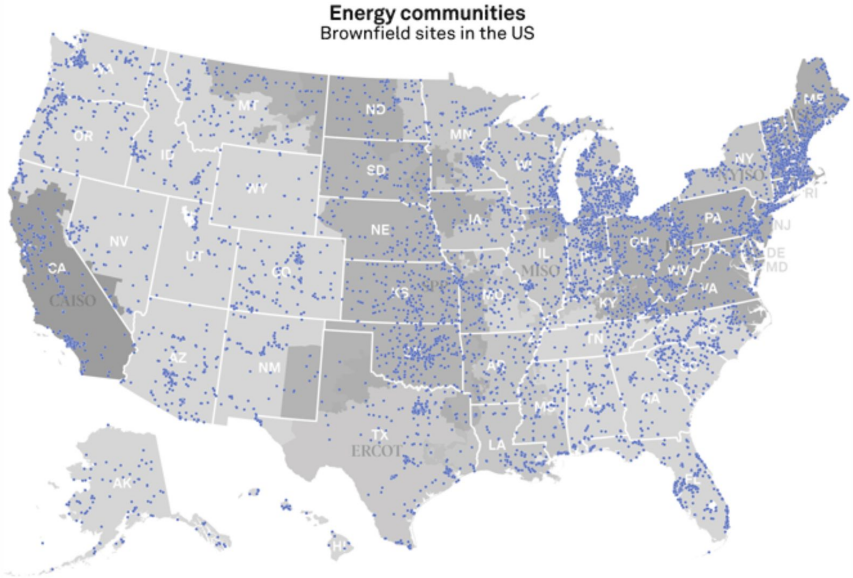

As of Sep. 14, 2022.
Map credit: Ciaralou Agpalo Palicpic.
Source: U.S. Environmental Protection Agency.
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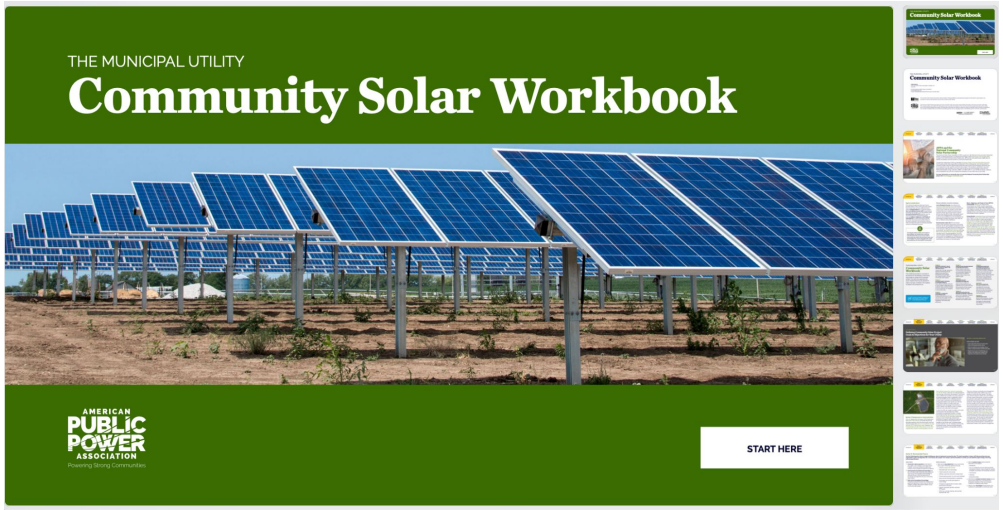
Programs and Resources

- https://www.energy.gov/communitysolar/community-power-acceleratortm Offers community solar education, financing and cash awards. Deadline for first round March 15.
- NCSP provides free one-on-one technical assistance on many aspects of community solar program design, stakeholder engagement, technical challenges, outreach and financing.
- https://www.rd.usda.gov/programs-services/energy-programs/rural-energy-america-program-renewable-energy-systems-energy-efficiency-improvement-guaranteed-loans/tx offers and entry point for USDA/REAP loans and related programs.
- See also: EPA, DOT, HUD, DOI, and more.
- BiPartisan Infrstructure Law as well as IRA.

A non-governmental non-profit, the Beneficial Electrification League, is focused on support for rural electric co-ops and public power, including a strong resource toolkit and up to date IRA information.

Program Design Guidance and More



For tips and resources to adapt this Community Solar Workbook for co-op use, see solarvalueproject.com or email jkcliburn@cliburnenergy.com

Additional links will be posted at TXSES.org!

Additional Slides

Commercial ITC Under IRA

	2022†	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	100% 2033*	75% 2034*	50% 2035*	0% 2036*
Projects Under 1 MWac															
Base ITC*	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	22.5%	15%	0%
Bonus for Meeting Domestic Content Minimums**		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Bonus for Siting in "Energy Community"		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Allocated Low-Income Bonus* **															
Low-Income Community as Defined by the New Markets Tax Credit or on Indian Land		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	7.5%	5%	0%
Qualified Low-Income Residential Building Project or Qualified Low-Income Economic Benefit Project		20%	20%	20%	20%	20%									
Projects Over 1 MWac that Begin Construction Less than 60 Days After Dept. of Treasury Is															
Base ITC*	30%	30%	30%												
Bonus for Meeting Domestic Content Minimums**		10%	10%												
Bonus for Siting in "Energy Community"		10%	10%												
Allocated Low-Income Bonus for Projects Under 5 MWac* **															
Low-Income Community as Defined by the New Markets Tax Credit or on Indian Land		10%	10%												
Qualified Low-Income Residential Building Project or Qualified Low-Income Economic Benefit Project		20%	20%												
Projects Over 1 MWac that Begin Construction 60 Days After Dept. of Treasury Issues Guid															
Base for All Projects															
Base ITC*	6%	6%	6%	6%	6%	6%									
Bonus for Meeting Domestic Content Minimums**		2%	2%	2%	2%	2%									
Bonus for Siting in "Energy Community"		2%	2%	2%	2%	2%									
Adders for Projects that Meet Labor Requirements															
Base ITC*	24%	24%	24%	24%	24%	24%									
Bonus for Meeting Domestic Content Minimums**		8%	8%	8%	8%	8%									
Bonus for Siting in "Energy Community"		8%	8%	8%	8%	8%									
Allocated Low-Income Bonus for Projects Under 5 MWac* **															
Low-Income Community as Defined by the New Markets Tax Credit or on Indian Land		10%	10%	10%	10%	10%									
Qualified Low-Income Residential Building Project or Qualified Low-Income Economic Benefit Project		20%	20%	20%	20%	20%									

Source: SEIA Summary of Inflation Reduction Act (H.R. 5376)

ITC and Direct-Pay Adders: The IRA provides a 30% benefit, directly paid to co-op and public power developers, for solar, storage and other low-carbon generation projects. Further, it will boost that % by one or more (stackable) "adders." Smaller, local projects (<5 MW) reap strong rewards.

* Actual phased down is based on the later of the dates shown or the year after electric sector CO2 emissions drop 75% below 2022 levels.

** Must include 100% domestic iron/steel and an increasing percent of manufactured goods over time.

*** Allocated credits will be based on an application and award process that will have to be developed by the Secretary. Maximum of 1.8 GWac/year.

†Bonus credits available for projects placed in service after December 31, 2022.

Source: SEIA IRA Summary